Technical Review No. 2
Dakotas Wind Transmission Study
HDR / Western Area Power Administration
Billings, Montana
March 29, 2005

Cristy Hoferer (HDR) opened with a welcome and introductions. The attendees and agenda are listed below.

Don Martin took a few minutes to explain how this Technical Review Session will actually involve discussion of Task 1 and Task 3. Task 2 is dependant on the outcome of Task 3, therefore Task 3 is a prerequisite to Task 2. The focus for this Review Session will involve discussion and work activities surrounding Task 1 and Task 3.

Task 1 – Analyze Non-Firm Transmission Potential Relative to New Wind Generation
Michael Brower (AWS TrueWind) presented an overview and results for the wind simulation to be used in Task 1. Background on wind and wind plant variability on geographic diversity of wind generation was presented and discussed. Assumptions and methodology for selection of the wind plant sites within the seven study zones identified in the study scope were presented and discussed. Concern was raised about the cost assumptions and resulting values for wind Cost of Energy. Tom Wind, Brian Parsons, and other meeting participants will provide feedback to Michael to improve the cost analysis. Generic 1.5 MW wind turbines at 65 meter hub height were modeled. Raising the hub height above 65 meters to align with current installations was discussed. Hourly wind plant output was simulated for the study year 2003 and for a typical year. It was noted that the study year of 2003 was not an abnormally high or low wind year. Wind maps and annual capacity factors for the seven study zones were presented and discussed. Michael Brower will check the simulated data sets to see if conclusions can be drawn relative to east-west and north-south geographic diversity benefits. Validation of the simulated wind data with actual measurements was presented and discussed. Additional validation was requested by the meeting participants. Michael will produce validations for the diurnal pattern for each of the four seasons and. Also, validation of the annual integration (area under the curve) will be checked. Matt Stoltz will check to see if annual hourly data sets are available from the two 40 MW FPL wind projects for use in validating the data.

Don Martin (ABB) presented preliminary results for Task 1. The approach and capabilities of the Gridview program used for Task 1 were discussed (hourly dispatch for a year, economic redispatch with the new wind generation added, generators outside the Dakotas are decremented). Don Martin will provide a list of the regions and generators that were used as sinks. The study year modeled is 2003 (based on 2003 generator data and 2003 wind simulations). The actual line flows for studied interfaces are also 2003. A sensitivity case is run for high hydro generation with 1997 hydro data. Meeting participants expressed concern that 2002 load data has been used in the 2003 modeled year. These concerns included likely mismatch in hour to hour generator and load data resulting in erroneous hourly flows on the study interfaces. This concern appears to be

supported by a visual comparison in the modeled base case interface flows and the actual interface flows which appear to correlate poorly. Don will statistically quantify this correlation (hourly deviations). Concern was also expressed that use of 2002 load data and 2003 generator data could result in a misalignment of the business days (Monday through Friday) load pattern. Don will confirm that an adjustment has been made to ensure this alignment. Don will also provide a "bookend" for the possible loading on the study interfaces from the new wind generation by directly comparing the simulated 2003 wind generation to the actual 2003 flows on the study interfaces. Concern was raised about whether the value of 1950 MW for the North Dakota Export Boundary is being correctly applied or whether the Transmission Reliability Margin (TRM) and Capacity Benefit Margin (CBM) should be netted off of this value first. Some meeting participants felt that the direct use of the 1950 MW value is appropriate and consistent with MAPP practices. Tom Wind, Matt Stoltz, and Ed Weber / Steve Sanders will look into and resolve this question. The definition of firm capacity was discussed.

Task 3 – Study Interconnection of New Wind Generation

Don Martin (ABB) presented preliminary analysis for Task 3. The base case and contingency overloads were presented and discussed. It was agreed that MAPP line rating B (conductor thermal rating) is most appropriate for this task. The analysis will be re-run with this line rating. Bus voltage data was presented and discussed. Meeting participants questioned the large number of bus voltage violations. This analysis will be reviewed and analyzed further by ABB. All sites will be analyzed initially at 500 MW, then at 250 MW. If most overloads are resolved at 250 MW, then a third run will be made at 375 MW. One example site (White) will be analyzed further to illustrate possible solutions to the identified overloads.

Task 2 – Assess Potential of Transmission Technologies Relative to New Wind Generation

Preliminary results for Task 2 will be presented at the next review.

Task 4 – Study the Delivery to Market of New Wind Generation

The methods and overall approach to Task 4 were discussed. The meeting participants agreed that the report will include qualitative discussion of potential innovative approaches to studying the delivery to market of new wind generation. Preliminary results for Task 4 will be presented at the next review.

A request was made to include a glossary in the report or at least make an effort to explain technical terms or abbreviations which are not widely known or understood. Also, the report will include a description and discussion of transmission line ratings and relevant measures including Available Transmission Capability, Transmission Reliability Margin, and Capacity Benefit Margin.

Schedule

A revised draft of Task 1 and an updated status of Task 3 will be distributed to meeting participants by e-mail by April 20th. Feedback will be solicited from participants by e-

mail over the following week. A conference call, if needed, is tentatively scheduled for 9 a.m. to 11 a.m. (MDT) Tuesday May 3rd.

The next technical review will be held from 1:30 p.m. to 5 p.m. (MDT) on Monday May 23rd and 8 a.m. to noon on Tuesday May 24th in Billings. The focus will be on preliminary results for Tasks 2 and 4 and on any remaining follow-up on Tasks 1 and 3.

Don Martin will prepare an updated project schedule.

Participants discussed preliminary handouts and slide presentation material, and agreed to avoid confusion and misinterpretation with these preliminary data and discussion items, which are still undergoing substantial changes, that delaying their posting to the DWTS Website may avoid confusion and misunderstandings. Review Session #3 will bring together answers to questions and concerns by the Review Session participants with more final, comprehensive, and accurate data/assumptions to post at that time.

Participants
Michael Brower, AWS TrueWind
Bob Gough, Intertribal COUP
Michele Farris (by phone), South Dakota Public Utilities Commission
Terry Fredericks, Intertribal COUP
Wayne Haidle (by phone), Montana Dakota Utilities
Cristy Hoferer, HDR/Western Area Power Administration
Don Martin, ABB
Sam Miller, Western Area Power Administration
Brian Parsons, National Renewable Energy Laboratory
Larry Schedin, LLS Resources / Wind on the Wires
Pat Spears, Intertribal COUP
Matthew Stoltz (by phone), Basin Electric Power Cooperative
Matt Schuerger, ESCS/HDR/Western Area Power Administration
Ed Weber, Western Area Power Administration
Tom Wind, Wind Utility Consulting / Intertribal COUP

DAKOTA WIND TRANSMISSION STUDY
AGENDA

March, 2005 Meeting
Boothill Inn, Billings MT

I. INTRODUCTION – 8 a.m.

A. Meeting Participants
B. Review Minutes of last Meeting

II. REVIEW OF TASK 1 RESULTS - Analyze Non-Firm Transmission Potentia Relative to New Wind Generation

A. Results of Wind Generation Estimates – Michael Brower
B. Gridview Transmission Constraint Evaluation Results – Don Martin
C. Review of Final Report Requirements – Don Martin

III. TASK 3 - INTERCONNECTION OF NEW WIND GENERATION (7 SITES)

A. Preliminary Results of Site Impact Studies – Don Martin
B. Additional SIS Work – Don Martin

IV. TASK 2 – ASSESS POTENTIAL OF TRANSMISSION ENHANCEMENT TECHNOLOGIES

A. Results from Gridview for Evaluation
B. Results from Site Impact Study for Evaluation

V. REVIEW OF SCHEDULE

A. Study Schedule
B. Proposed Technical Review Meeting Dates
Meeting #3 (Draft results for Tasks 3 & 4) Tuesday, May 24th

VI. Adjourn